

### **REMARKS**

In the Office Action of June 24, 2002, Claims 1 - 10 were rejected. No claim was allowed. In response, Claims 4 - 9 are canceled, Claims 1 and 10 are amended and new Claims 11 - 16 are added to the application. Reexamination and reconsideration are respectfully requested in view of the foregoing amendments and the following remarks.

### **Amendment to Specification**

The specification is amended to correct clerical errors.

In particular, Example 2 is amended to provide that the abbreviation of 2-ethyl-4-methylimidazole is "2E4MZ" as shown in the attached page from the Catalogue of Chemical Products distributed by Shikoku Chemical Corp. This provides clarification to Tables 1 and 2 on pages 29 and 32, respectively, which list "2E4MZ" as the curing accelerator in Example 2 and 9.

Example 4 is amended to provide that the curing accelerator is 1-cyanoethyl-2-methylimidazolium trimellitate (2MZ-CNS). Table 1 lists the curing accelerator as being "2MZ-CNS", and the attached page from the Catalogue of Chemical Products distributed by Shikoku Chemical Corp shows that 2MZ-CNS is 1-cyanoethyl-2-methylimidazolium trimellitate.

Accordingly, it is respectfully submitted that the amendments to the specification are not new matter

### **Support for Claim Amendments and New Claims 11 - 16**

Claim 1 is amended to incorporate the limitations of canceled Claims 4 - 6. In particular, the present invention as set forth in independent Claim 1 is defined to include an antioxidant, as formerly provided in canceled dependent Claim 5. Further,

the amounts of the epoxy resin, curing accelerator and antioxidant are now specified in Claim 1.

New Claims 11 - 16 incorporate subject matter that was contained in previous claims, particularly canceled Claims 7 - 9. Accordingly, it is respectfully submitted that the amendments to Claims 1 and 10 and new Claims 11 - 16 do not constitute new matter.

**Rejection of Claims 1 - 10 under 35 U.S.C. §103(a) over Hefner, Jr. in view of Dershem and Namba et al or JP Nos. 61-291615 or 2-214741**

Claims 1 - 10 were rejected under 35 U.S.C. §103(a) as obvious over Hefner, Jr. (U.S. Patent No. 4,612,359) in view of Dershem (U.S. Patent No. 5,969,036) and Namba (U.S. Patent No. 4,764,571) or JP 61-291615 or JP 2-214741. The Examiner alleges that Hefner, Jr. shows a composition comprising a blend of dicyanates, a bisphenol A epoxy resin and cobalt naphthenate and that Namba and the Japanese patents ascribe excellent low residual stress after curing, heat resistance, flexibility, moisture resistance, through-hole reliability and high-frequency property to the dicyclopentadiene-phenol epoxy resin of claimed formula (1). The Examiner takes the position that it would have been obvious to employ the disclosed dicyclopentadiene-phenol epoxy resin of Hefner, Jr. as the epoxy resin in order to impart excellent low residual stress after curing, heat resistance, flexibility, moisture resistance, through-hole reliability and high-frequency property according to Namba et al. and the Japanese patents. The Examiner further alleges that Dershem espouses a formulation containing a polycyanate, an epoxy monomer wherein aromatic polyglycidyl ethers are preferable, metal catalysts, "catalysts for curing the epoxy monomers" such as preferably imidazoles, and an antioxidant. The Examiner

takes the position that it would have been obvious to incorporate an imidazole curing catalyst of Dershem et al. to cure the epoxy resin of Hefner, Jr. in order to obtain a uniformly and completely cured product.

This rejection is traversed as it may apply to Claims 1 - 3 and 10 as amended herein and to new Claims 11 - 16. The present invention relates to a cyanate-resin composition comprising (A) a cyanate compound having two or more cyanato groups in one molecule, (B) an epoxy resin, (C) curing accelerator comprising a compound that accelerates the curing reaction of the cyanate type compound and a compound that accelerates the curing reaction of said epoxy resin, and (D) an antioxidant.

Hefner, Jr discloses a composition comprising a blend of dicyanates, a bisphenol A epoxy resin and cobalt naphthenate. The reference does not disclose or suggest two kinds of curing accelerator and does not disclose or suggest an antioxidant. The use of bisphenol A type epoxy resin is disclosed by Hefner, Jr. but when such an epoxy resin is used in place of epoxy resin derived from a dicyclopentadiene-phenol polyaddition product, desirable properties are not obtained as shown in Comparative Examples 1, 2, 6 and 7 of the present specification.

Further, Hefner, Jr. does not disclose or suggest a resin composition for the use for preparing prepregs, metal foil-laminated plates, and printed wiring boards.

Namba et al and the Japanese patents disclose a dicyclopentadiene-phenol epoxy resin of claimed formula (1). The reference does not disclose a composition that includes two kinds of curing accelerators and the antioxidant as in the composition of the present invention.

Dershem relates to an adhesive for attaching a semiconductor device to a carrier substrate and not to a resin composition for preparing a prepreg, as in the

✓ present invention. Therefore, even though Dershem discloses an imidazole catalyst and an antioxidant in its adhesive composition, this teaching is not relevant to a resin composition for a prepreg, according to the present invention. In particular, Dershem teaches that the antioxidant is used to improve the thermo-oxidative stability of a high temperature polymer, especially a paste composition containing finely divided silver (see Col. 9, lines 7 - 38.) In the present invention, on the other hand, the antioxidant is used in specific amounts to improve insulating characteristics and to improve galvanic corrosion resistance. These advantages are neither taught nor suggested in Dershem. Accordingly, there is no motivation derived from Dershem for combining an antioxidant with a resin composition of Hefner, Namba and the Japanese patents, and such a combination can only be based on hindsight based the disclosure of the present invention.

✓ Moreover, the present invention as amended herein requires each of the components (A) through (D) to be present in specific amounts in order to achieve specific effects described in the specification, including improvements in dielectric constant, glass transition temperature, susceptibility to water and flame retardancy. These specific amounts are neither taught nor suggested by the cited references.

Accordingly, it is respectfully submitted that Claims 1 - 3, 10 and new Claims 11 - 16 would not have been obvious over Hefner, Jr., Dershem, Namba, JP 61-291615 or JP 2-214741, alone or in combination.

**Rejection of Claims 1 - 10 under 35 U.S.C. §103(a) over Gaku et al in view of Dershem and Namba et al or JP Nos. 61-291615 or 2-214741**

Claims 1-10 were rejected under 35 U.S.C. §103(a) as being obvious over Gaku et al (U.S. Patent No. 4,740,343) in view of Dershem and Namba, JP 61-

291615 or JP 2-214741. The Examiner alleges that Gaku teaches a blend of polycyanate ester, epoxy resins and curing catalysts. The Examiner takes the position that it would have been obvious to combine the dicyclopentadiene-phenol epoxy resin of Namba or the Japanese patents as the epoxy resin of Gaku and that it would have been obvious to combine the cobalt naphthenate of Gaku with the disclosed imidazole based on the teaching in Dershem that mixtures of metal catalysts and imidazoles are useful to cure polycyanate/epoxy resin compositions.

✓ This rejection is traversed as it may apply to Claims 1 - 3 and 10 as amended  
✓ herein and to new Claims 11 - 16. Gaku does not teach or suggest a resin composition that includes an antioxidant for improving insulating characteristics and galvanic corrosion resistance of the resin composition. Moreover, Gaku relates to a method of producing a rigid resin mold, which is quite different from the cyanate-epoxy resin composition for preparing prepregs, metal foil-laminated plates and printed wiring boards according to the present invention. As discussed above, Dershem discloses an antioxidant, but in a different context and for a different purpose than that of the present invention. Accordingly, there is no motivation derived from Dershem for combining an antioxidant with a resin composition of Gaku, Namba and the Japanese patents, and such a combination can only be based on hindsight based the disclosure of the present invention.

Moreover, as discussed above, the present invention as amended herein requires each of the components (A) through (D) to be present in specific amounts in order to achieve specific effects described in the specification, including improvements in dielectric constant, glass transition temperature, susceptibility to water and flame retardancy. These specific amounts are neither taught nor suggested by the cited references.

Accordingly, it is respectfully submitted that Claims 1 - 3 and 10 and new Claims 11 - 16 would not have been obvious over Gaku, Dershem, Namba , JP 61-291615 or JP 2-214741, alone or in combination.

**Rejection of Claims 1 - 10 under 35 U.S.C. §103(a) over Dershem et al in view of and Namba et al or JP Nos. 61-291615 or 2-214741**

Claims 1-10 were rejected under 35 U.S.C. §103(a) as being obvious over Dershem, in view of Namba, JP 61-291615 or JP 2-214741. The Examiner alleges that it would have been obvious to use the dicyclopentadiene-phenol epoxy resin of Namba or the Japanese patents as the aromatic polyglycidyl ether of Dershem in order to impart excellent low residual stress after curing, heat resistance, flexibility, moisture resistance, Through-hole reliability and high-frequency property;

This rejection is traversed as it may apply to Claims 1 - 3 and 10 as amended herein and to new Claims 11 - 16. As discussed above, Namba et al and the Japanese patents do not disclose an imidazole catalyst or an antioxidant as in the composition of the present invention. Also, as discussed above, Dershem discloses a composition having an antioxidant, but this disclosure is in the context of an adhesive for attaching a semiconductor device to a carrier substrate and not to a resin composition for preparing a prepreg, as in the present invention. Therefore, even though Dershem discloses an imidazole catalyst and an antioxidant in its adhesive composition, this teaching is not relevant to a resin composition for a prepreg, according to the present invention. In particular, Dershem teaches that the antioxidant is used to improve the thermo-oxidative stability of a high temperature polymer, especially a paste composition containing finely divided silver (see Col. 9, lines 7 - 38.) In the present invention, on the other hand, the antioxidant is used in

specific amounts to improve insulating characteristics and to improve galvanic corrosion resistance. These advantages are neither taught nor suggested in Dershem. Accordingly, there is no motivation derived from Dershem for combining an antioxidant with a resin composition of Namba and the Japanese patents, and such a combination can only be based on hindsight based the disclosure of the present invention.

Moreover, as discussed above, the present invention as amended herein requires each of the components (A) through (D) to be present in specific amounts in order to achieve specific effects described in the specification, including improvements in dielectric constant, glass transition temperature, susceptibility to water and flame retardancy. These specific amounts are neither taught nor suggested by the cited references.

Accordingly, it is respectfully submitted that Claims 1 - 3, 10 and 11 - 16 would not have been obvious over, Dershem, Namba , JP 61-291615 or JP 2-214741, alone or in combination.

### **Conclusion**

In view of the foregoing amendments and remarks, it is respectfully submitted that Claims 1 - 3, 10 and 11 - 16 are in condition for allowance. Favorable reconsideration is respectfully requested.

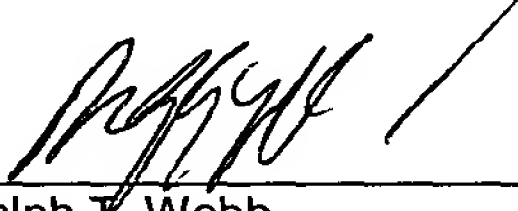
Should the Examiner believe that anything further is necessary to place this application in condition for allowance, the Examiner is requested to contact applicants' undersigned attorney at the telephone number listed below.

Kindly charge any additional fees due, or credit overpayment of fees, to  
Deposit Account No. 01-2135 (500.40168X00).

Respectfully Submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

By

  
\_\_\_\_\_  
Ralph T. Webb  
Reg. No. 33,047

Attachments: Relevant page from Catalogue of Chemical Products  
Shikoku Chemicals Corp.  
Marked-up Copy Showing Changes Made

RTW/dlt  
Tel.: (703) 312-6600  
Fax.: (703) 312-6666



**MARKED-UP COPY TO SHOW CHANGES MADE****IN THE SPECIFICATION:**

Please replace the paragraph beginning on page 24, line 21 with the following:

A cyanate-epoxy resin composition varnish was prepared in the same way as in Example 1 except that a bis (3,5-dimethyl-4-cyanatephenyl)methane prepolymer (Arocy M-30, trade name, produced by Asahi Ciba Ltd.; monomer reaction rate: about 46%; number-average molecular weight: 490; cyanate equivalent: 219) was used as the cyanate type compound (A) containing two or more cyanato groups in one molecule in place of the ~~2,2-bis-(4-cyanatephenyl)propane~~ 2,2-bis(4-cyanatephenyl)propane prepolymer, and it was dissolved in methyl ethyl ketone in the ratio shown in Table 1, and that zinc naphthenate was used in place of cobalt naphthenate and 2-ethyl-4-methylimidazole (2E4MZ) was used in place of 2-methylimidazole, they being blended in the ratios shown in Table 1.

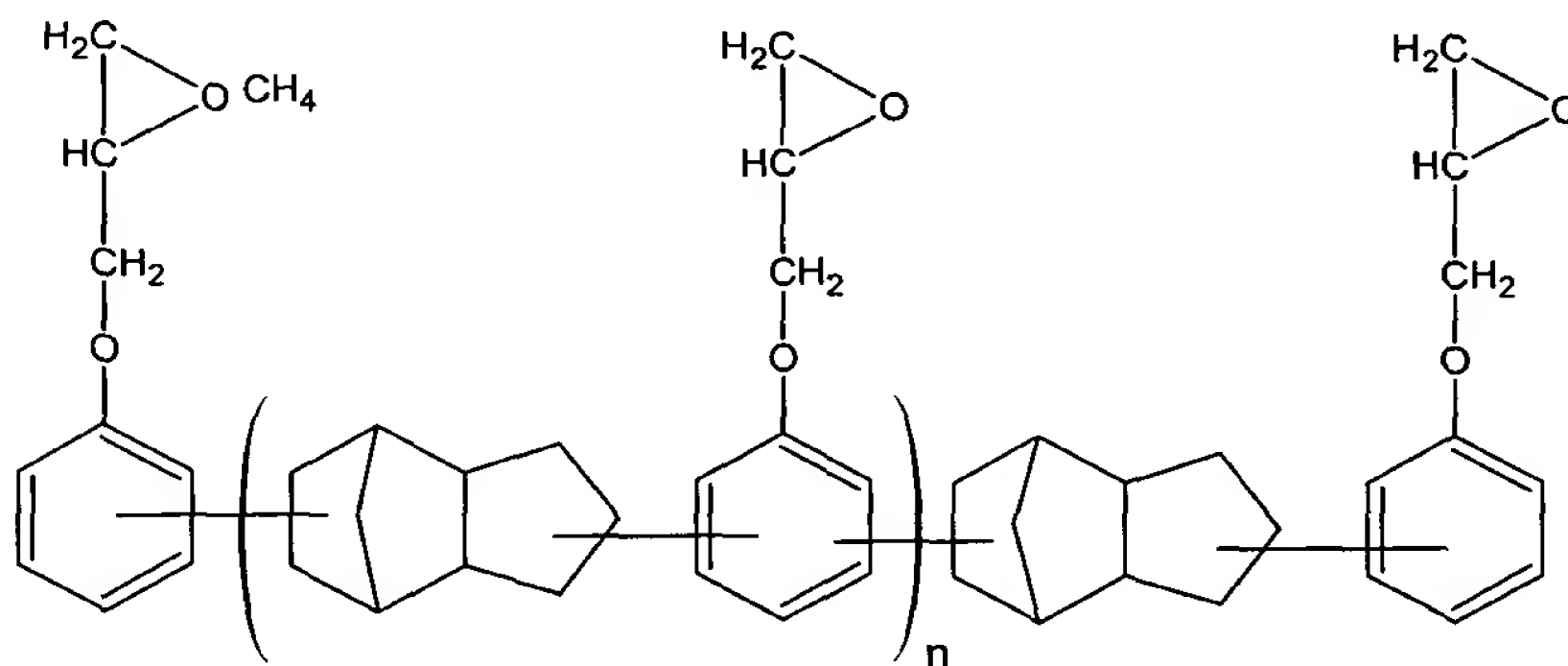
Please replace the paragraph on page 25, line 17 with the following:

A cyanate-epoxy resin composition varnish was prepared in the same way as in Example 1 except that zinc ~~naphthenae~~ naphthenate was used in place of cobalt naphthenate and ~~2-undecylimidazole (C11Z,~~ 1-cyanoethyl-2-methylimidazolium trimellitate (2ME-CNS, trade name, produced by Shikoku Chemicals Corp.) .was used in place of 2-methylimidazole (2MZ) and blended in the ratios shown in Table 1.

**IN THE CLAIMS:**

Please amend Claims 1 and 10 as follows:

1. (Amended) A cyanate-epoxy resin composition comprising (A) a cyanate type compound containing two or more ~~eyante~~ cyanato groups in one molecule thereof, (B) an epoxy resin, ~~and~~ (C) a curing accelerator, and (D) an antioxidant as main components, wherein the epoxy resin is derived from a dicyclopentadiene-phenol polyaddition product having a dicyclopentadiene skeleton represented by the following formula (1); ~~and the curing accelerator comprises (i) a compound having a catalytic function to accelerate the curing reaction of the cyanate type compound containing two or more cyanato groups in one molecule and (ii) a compound having~~



~~a catalytic function to accelerate the curing reaction of the epoxy resin:~~

(1)

{wherein n is 0 or a positive integer},

and the curing accelerator comprises (i) a compound having a catalytic function to accelerate the curing reaction of the said cyanate type compound (a) and (ii) a

compound having a catalytic function to accelerate the curing reaction of the epoxy resin,

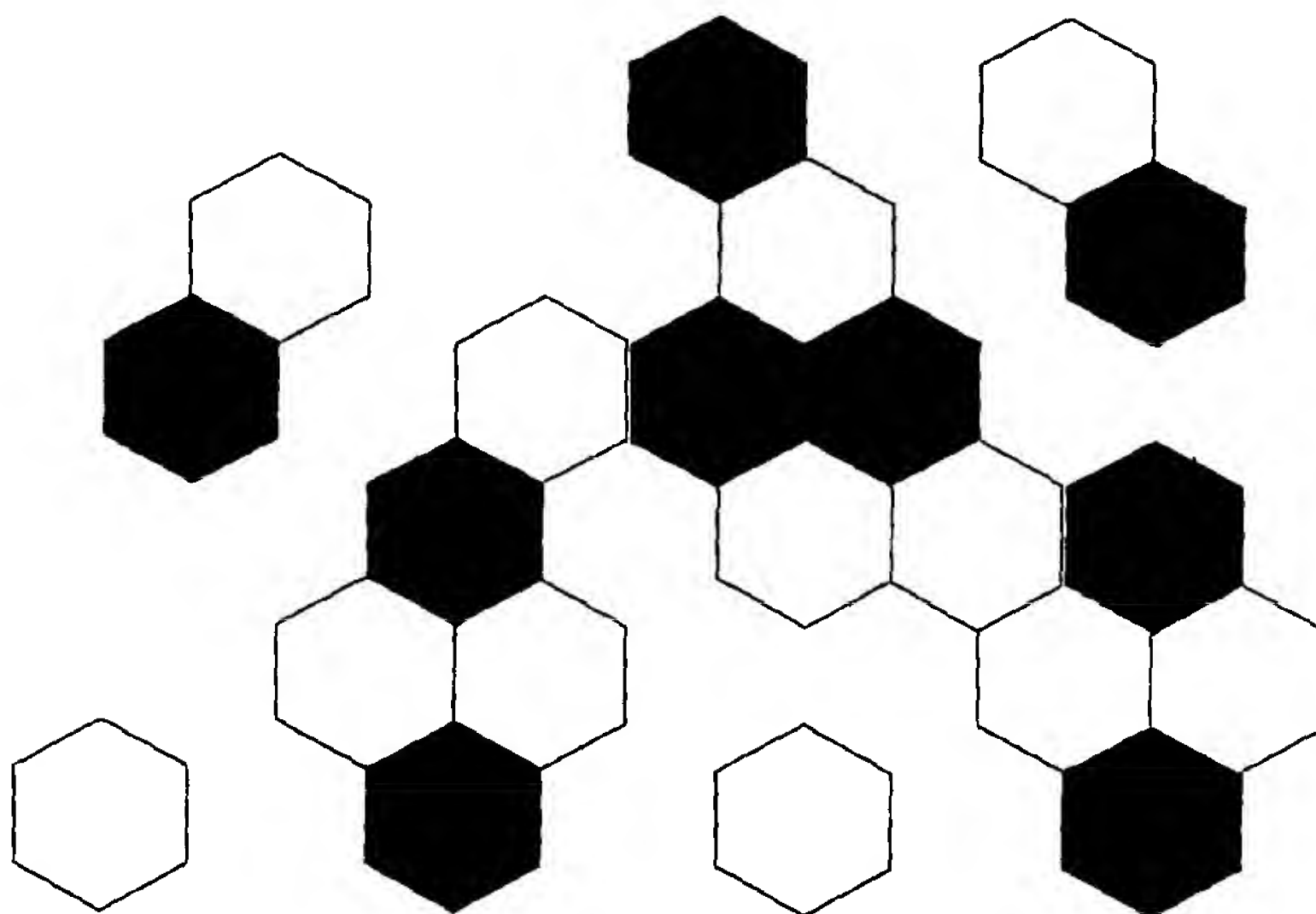
wherein the epoxy resin (B) is contained in an amount of 50 to 250 parts by weight, the curing accelerator (C) is contained in an amount of 0.1 to 5 parts by weight and the antioxidant (D) is contained in an amount of 0.1 to 20 parts by weight per 100 parts by weight of said cyanate type compound (A).

10. (Amended) A cyanate-epoxy resin composition according to ~~any one of Claims 1 to 6~~ Claim 1, wherein the compound having a catalytic function to accelerate the curing reaction of the cyanate type compound (A) is at least one of the organic metal salts or organic metal complexes of one or more of the metals selected from iron, copper, zinc, cobalt, nickel, manganese and tin, and the compound having a catalytic function to accelerate the curing reaction of the epoxy resin (B) is at least one compound selected from imidazole and its derivatives, organic phosphorus compounds, secondary amines, tertiary amines and quaternary ammonium salts.

# SHIKOKU CHEMICALS

化成品製品カタログ

CATALOGUE OF CHEMICAL PRODUCTS



四国化成工業株式会社

Shikoku Chemicals Corp.

## イミダゾール Imidazole

●商品名：キュアゾール（エポキシ硬化剤として登録されたイミダゾール化合物の名称）

●用途：エポキシ硬化剤，アクリル繊維染色助剤，医薬，染料中間体，写真感光材料，防錆剤，ゴム加硫促進剤，帯電防止剤等

性 状	Abbreviation	Chemical Name	Appearance	Melting point (°C) (standard value)	
商品略号	化	学	名	外 観	融点(°C) (標準値)
2MZ	2-メチルイミダゾール		白～淡黄色小フレーク状固体	137～145	
2E4MZ	2-エチル-4-メチルイミダゾール	2-ethyl-4-methylimidazole	淡黄色～淡褐色液体又は固体	about 約41	
C <sub>11</sub> Z	2-ウンデシルイミダゾール		白～淡黄色小フレーク状固体	69～74	
C <sub>17</sub> Z	2-ヘプタデシルイミダゾール		白 ～ 淡 黄 色 粉 末	86～91	
※ 2PZ	2-フェニルイミダゾール		淡桃色～淡黄色小フレーク状固体	137～147	
2P4MZ	2-フェニル-4-メチルイミダゾール		淡橙色～淡桃色小フレーク状固体	174～184	
1B2MZ	1-ベンジル-2-メチルイミダゾール		淡黄色～淡褐色液体又は固体	48～52	
2MZ-CN	1-シアノエチル-2-メチルイミダゾール		淡黄色～褐色液体又は固体	55～56	
2E4MZ-CN	1-シアノエチル-2-エチル-4-メチルイミダゾール		淡黄色～褐色液体又は固体	室温～32	
C <sub>11</sub> Z-CN	1-シアノエチル-2-ウンデシルイミダゾール		白 ～ 淡 黄 色 固 体	47～52	
2PZ-CN	1-シアノエチル-2-フェニルイミダゾール		白 色 粉 末	105～111	
2MZ-CNS	1-シアノエチル-2-メチルイミダゾリウムトリメリテイト		白 色 粉 末	170～177	
2E4MZ-CNS	1-シアノエチル-2-エチル-4-メチルイミダゾリウムトリメリテイト		白 色 粉 末	157～166	
C <sub>11</sub> Z-CNS	1-シアノエチル-2-ウンデシルイミダゾリウムトリメリテイト		白 色 粉 末	123～129	
※ 2PZ-CNS	1-シアノエチル-2-フェニルイミダゾリウムトリメリテイト		白 色 粉 末	175～183	
※ 2MZ-A	2,4-ジアミノ-6-[2'-メチルイミダゾリル-(1')]エチル-s-トリアジン		白 ～ 淡 黄 色 粉 末	248～258	
2E4MZ-A	2,4-ジアミノ-6-[2'-エチル-4'-メチルイミダゾリル-(1')]エチル-s-トリアジン		白 ～ 淡 黄 色 粉 末	220～230	
C <sub>11</sub> Z-A	2,4-ジアミノ-6-[2'-ウンデシルイミダゾリル-(1')]エチル-s-トリアジン		白 ～ 淡 黄 色 粉 末	187～195	
※ 2MA-OK	2,4-ジアミノ-6-[2'-メチルイミダゾリル-(1')]エチル-s-トリアジン イソシアヌル酸付加物		白 色 粉 末	250(分解)	
2MZ-OK	2-メチルイミダゾール イソシアヌル酸付加物		白 色 粉 末	250(分解)	
2PZ-OK	2-フェニルイミダゾール イソシアヌル酸付加物		白 ～ 淡 橙 色 粉 末	140(分解)	
※ 2PHZ	2-フェニル-4,5-ジヒドロキシメチルイミダゾール		淡 橙 色 粉 末	213～225	
※ 2P4MHZ	2-フェニル-4-メチル-5-ヒドロキシメチルイミダゾール		白 色 粉 末	191～195	
2PHZ-CN	1-シアノエチル-2-フェニル-4,5-ジシアノエトキシメチルイミダゾール		淡 褐 色 粘 稠 液 体	—	
SFZ	1-ドデシル-2-メチル-3-ベンジルイミダゾリウムクロライド		黄 褐 色 塊 状	56～66	
2PZL	2-フェニルイミダゾリン		淡桃色～淡黄色小フレーク状固体	95～104	

※微粉砕グレード(PW)も用意しております。

●銘柄によっては、劇物、消防法危険物第4類又は指定可燃物に該当する。

→ 1-cyanoethyl-2-methylimidazolium trimellitate white powder

## 荷 姿

商 品	形 態	正 味 重 量
粉 末	ダンボールケース (ポリエチレン内装)	15kgs. 20kgs
液 体	ダンボールケース (ブリキ缶)	17kgs. 18kgs